the Conservation Resource

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The Northern Bobwhite—nature's representative for habitat diversity

by Elsa Gallagher, Upland Wildlife Coordinator

Missourians naturally associate quail with open lands and brushy draws, fencerows and crop field edges. However, these types of habitat are disappearing from the Missouri landscape. With them, we stand to lose a multitude of species.

Quail habitat in Missouri has decreased dramatically in past decades as cedars and honey locusts relentlessly invade valuable open land. In addition, a diversified landscape is slowly being replaced by urban developments, larger crop fields and pastures dominated by fescue and brome. These choke out the forbs, legumes and bare ground necessary for quail survival.

Landscapes often change so slowly it's hard to notice differences. It's likely, however, that fencerows that held quail in your grandfather's day have changed significantly. Over time, large parts of the landscape have become quail deserts. These landscape changes are reflected in annual quail roadside surveys. In 1987 the annual survey reported a statewide average of 16.85 quail per 30-mile route. By 2001 the statewide average had declined to 3.46 quail per 30-mile route. The most recent survey, conducted in August 2004, shows a slight increase with an average of 3.62 quail.

Habitat that supports quail also sustains a variety of other birds. Many of these, including the Bell's vireo, dickcissel, grasshopper sparrow, Henslow's sparrow, loggerhead shrike, Bewick's wren, field sparrow and brown thrasher, also have experienced drastic population declines.

Fortunately, people are learning that they play an important role in restoring quail populations in Missouri. Landowners willing to devote 5 to 10 percent of their property to quail management will often see an immediate response of higher quail numbers. Good habitat can also be established on public lands including schoolyards, parks and abandoned fields.

Quail thrive in areas with high habitat diversity. These diverse habitats can include agricultural lands, native grasslands, savanna habitats and pasture ground and small acreages. In most cases, bobwhite quail habitat can be created or enhanced with some combination of discing, burning, brushpile building, edge feathering, spraying, shrub planting and establishing food plots.

Education and habitat improvement are key components to restoring quail and other grassland species. While the Conservation Department is committed to improving habitat on conservation areas, the fate of the quail and other grassland species will be decided on private land. Education on the habitat needs of grassland species and habitat management can start in the classroom. This issue of the *Conservation Resource* provides information, instructional ideas and resources to help Missourians of all ages become more aware of the role they can play in restoring critical habitat.

In this issue—

An entire issue devoted to
Critical Habitats

Changing Landscapes

Historic Vegetation

Historically Missouri was a complex mixture of prairie, savanna, woodland and forest. Due to its central continental position, Missouri has experienced an invasion and retreat of different plant associations from all directions resulting in an extremely rich biological diversity.

Prairies in the early nineteenth century, before extensive Euro-American settlement, occupied about a third of the state. The broadest prairies were in the Osage Plains of west-central Missouri and in the Grand Prairie centering on Audrain County in the northeast. Elsewhere in the northern part of the state, smaller prairies interlaced with strips of timber in stream valleys and on steeper slopes in tracts of rougher land. This mosaic of forest and grass provided an exceptional length of "edge" habitat. Changing land uses by Native Americans and an increasingly cooler climate just prior to Euro-American settlement of western and northern Missouri resulted in forest encroachment on grasslands. These numerous areas of tree expansion onto grasslands are called savannas or woodlands.

Presettlement vegetation of the Ozarks included primarily true forests and woodlands along with savanna and prairie tracts. Dominated by oaks, the true forests covered the hills of the Current, Black, St. Francis, Meramec and Gasconade River basins of the eastern Ozarks. The roughest lands of the White and Elk River basins of the southwestern Ozarks were also dominated by true forests. Along with oaks, pine was present in these forests, particularly in the Current and upper Meramec and Gasconade basins.

Woodlands prevailed throughout most of the central and western Ozarks. In many places it opened into tracts properly called savanna, as in karst uplands in Howell and Laclede counties. Oaks dominated the Ozark woodlands as well as forests. Glades occurred across the Ozarks but were most prevalent in the White River region.

Historically, the southeastern lowlands region contained by far the densest forest of Missouri. It had the tallest and greatest variety of trees and produced the most biomass. This region of Missouri contained a substantial number of plants and animals associated with the subtropical forests of the lower Mississippi River valley. Of all the regions, the southeastern lowlands has lost the greatest part of its historic vegetative cover.

Current Land Cover

The current land cover of Missouri is the result of several thousand years of both continuous natural processes and human activities. Accelerating human activites since Euro-American settlement have substantially changed the vegetative cover. Current land cover is as much the result of the division of the land into properties as it is the product of natural environmental conditions.

Shortly after statehood in the 1820s, settlers began clearing northern Missouri of prairie and other vegetation to make way for farms. Today, the general land cover in this part of the state is a complex mixture of cropland on smoother surfaces and better soils, pasture on irregular surfaces and eroded soils, and woods on steeper slopes and rougher tracts. Current vegetative cover hides the fact that much of the land was cropped and severely eroded a century ago. Trees and invasive tree species in woodlands have become more predominant while native prairies have become rare.

The Osage Plains of west-central Missouri have experienced a similar history of land use, although the conversion of prairies to cropland occurred two to three decades later. In general, there has been relatively less cropland loss in west-central Missouri in the last half century than in the northern part of the state. So, the amount of invasive timber in woodlands is less, and the land cover remains more open in pastures and cropland. More native prairie remains in this region than anywhere else in the state.

Land cover of the Ozarks shows two distinct regions. Most of the western Ozarks has considerably more cropland and pasture than the eastern Ozarks, which is more forested. The eastern Ozarks, the Gasconade and Osage River hills, and the White River country are the most thoroughly forested regions of Missouri. However, much of the original tree cover was cut down during the lumber days of the first decade of the 20th century. What exists today is essentially a second-growth forest.

The most thoroughly agricultural region of Missouri is the southeastern lowlands. Almost 95 percent (excluding Crowley's Ridge) is in farms, and almost all of those are in croplands, with very little land in pasture. Remnants of the lowland forests that once covered the region occur in small, managed tracts and in locations without levees to protect them from flooding.

Urbanization has resulted in significant landscape changes across the state. In the years prior to statehood, forty percent of present day St. Louis and Kansas City were covered with prairie. Today, these metropolitan areas extend into eight and five counties, respectively. Other officially designated metropolitan areas in the state cover eight more counties.

The plant cover of Missouri will continue to change. While some changes may hurt native species, other changes will help. As more is learned about the effects of habitat loss on species populations, management practices that improve, or at least sustain, wildlife can become increasingly more common.

Habitats of Concern

Excerpted from articles appearing in issues of the Missouri Conservationist *written by Richard Thom and staff writers.*

Glades

In Missouri, glades are most commonly found in rugged, hilly terrain, often occupying the slopes that face south and west. The drying effects of the wind and the direct rays of the sun on these slopes combine with thin soil and the forces of erosion to make tree growth difficult. Rock fragments and small boulders are typically scattered across glades.

Glades can be classified by the type of bedrock on which they form. The most common glade-forming rocks in Missouri are limestone (calcium carbonate) and dolomite (calcium magnesium carbonate).

Limestone/dolomite glades have similar plant communities, reflecting the chemical characteristics of these similar rocks and their relationship to the soil that forms over them. Glades can occur wherever these rocks are exposed, but the most extensive limestone/dolomite glades occur in the Ozarks.

Although some kinds of trees and shrubs are part of the glade flora, glades are dominated by perennial herbaceous plants such as grasses and wildflowers. Many of these plants are the same as those found in prairies. These include grasses such as little bluestem, Indian grass and sideoats gramma, and wildflowers such as Indian paintbrush, cream false indigo, pale coneflower and purple prairie clover.

Post oak, persimmon, redbud, dogwood, sumac, gum bumelia, New Jersey tea and Indian cherry are some woody plants commonly growing on glades. Although red cedar is abundant on many glades, this tree becomes less common on glades that are managed with fire.

Because of the glade's harsh conditions, vegetation and wildlife show some desert-like adaptations. Some of the plants have succulent stems such as prickly pear cactus, Missouri evening primrose and rock pink. They also have extensive root systems, or they grow during the wet spring season and become dormant during the summer.

Glade animals cope by restricting their activities when conditions are especially harsh. Lizards take refuge in burrows or rock crevices, and scorpions, pygmy rattlesnakes and mice forage at night. In the middle of a summer drought, there is not much daytime activity on Missouri glades.

Glades are far more complex than they appear—and more fragile. Shallow soils, openness, drought and grass all combine to build these unique prairie outposts. We are learning that fire, prescribed and controlled, is critical to their defense. Whether you call them glades, balds or barrens, they are a fascinating part of the Missouri landscape. With judicious stewardship, they will remain so for ages to come.

Plan a Prairie Field Trip

To find a list of prairies in our state to visit our Web site at <www.missouriconservation.org>.

- Click on "Places to Go" in the top banner.
- Click on "Conservation Atlas" in the green box on the left.
- Under Find Areas, click on "with particular types of land cover (forest land, wetlands, etc.)."
- Select "prairie" from the Search by Landcover drop-down menu.
- Click "Submit."
- Click on any entry for more details.

Habitats of Concern *(continued)*

Savannas

Savannas consist of widely-spaced trees, mainly oaks with occasional hickories, growing over an open understory with a ground cover of prairie grasses and wildflowers. They typically occur in association with prairies or glades.

Many factors combine to determine which ecosystem will dominate a landscape. Topography, soil and the direction slopes face all have influences on the plants that grow there, but the most important factor is fire, or the lack of it.

Research shows fire was common in presettlement Missouri. Prairies often burned once every three years. These prairie fires rolled toward the east into the advance of the eastern forests. The effect was to push the forest back. With the absence of fire, the forest would begin to advance westward. This east/west tug of war continued for thousands of years and the results were the growth of savannas and the diverse plant groupings they often contain.

Savanna sites can be identified today by looking at plants, soil and other factors. Often these sites are on arid slopes and abound in oak sprouts and eastern red cedar.

Savanna restoration holds the key to some rare plants such as buffalo clover. Wildlife also benefits when savannas are restored. Deer, turkey, quail and rabbits all use savannas for feeding and rearing their young. Spotted skunks and Bachman's sparrows, both endangered species, find a new place to live in a restored savanna.

All natural plant groupings are dynamic, but none more so than savanna communities. In the battle for ecosystem supremacy, savannas are nature's own proving grounds.

Prairies

When European explorers first came to North America, they used the word prairie—the French word for meadow—to describe the vast grasslands they encountered.

While prairies are dominated by grasses, Missouri tallgrass prairies are really communities of as many as 300 different kinds of grasses, forbs (broad-leaved plants), and a few woody shrubs and trees. Some prairie plants can grow 8 feet tall or more.

The plants we see above ground are only part of the prairie plant community. Prairie plants have deep and complex root systems, some as deep as 15 feet. Prairie plant roots absorb water much better than the shallow roots of imported cool-season grasses such as tall fescue, brome and bluegrass. Having most of their mass underground, prairie plants are better able to survive fire and drought. Also, they have their growing points at or below ground level to withstand periodic fires and grazing. As prairie plants die, bacteria, fungi and other microorganisms break down the roots, creating some of the richest, deepest soil in the world.

More than 99 percent of Missouri's original prairie has been converted to agriculture and other human development. The rarity of our remaining prairie makes the efforts to protect and restore them all the more valuable.

Instructional Idea

- The following native grasses are good choices for helping to restore Missouri prairies: prairie dropseed, bottlebrush grass, creek oats, longspike tridens, sideoats grama, June grass, Indiangrass, big bluestem, little bluestem, switchgrass, sand lovegrass. Choose four of these grasses to research – describing where and how they grow best, their physical characteristics (height, color), etc. Find photos or sketch pictures of each.

Quail Habits & Habitat

Habits

In spring, male quail often ruffle up a cocky topknot for a stroll among the females or for an hour of whistling from a fence post or tree. The male's favorite song is his own name, *bob WHITE*, which is often imitated by starlings and mockingbirds. Quail are very social, grouping together during fall and winter as coveys of 10-20 birds.

While quail do fly, they spend most of their time on the ground foraging for seeds and insects and avoiding predators. Typically quail have two daily feeding periods: one beginning at daylight and continuing for several hours, the second beginning during mid-afternoon and continuing until roosting. Abundance and quality of the food items influence the length of feeding periods. Timing and length of feeding periods may be altered by adverse weather as well as disturbances, particularly those serious enough to cause the birds to flush. Birds that have been flushed may miss a meal entirely.

Quail take practically all their food from or within 8 inches of the ground's surface. Bobwhite are not strong scratchers and are incapable of reaching food that is buried in the soil or in heavy accumulation of dead vegetation. Fortunately the list of quail foods is extremely long. According to various studies of fall and winter bobwhite food habits, the most frequently consumed foods are seeds of native ragweed, lespedezas or naturalized forbs and most grains, such as corn, sorghum, sunflowers and soybeans.

Greens are an important spring and summer food, and a supplement during fall and winter. Soft ripe fruits are seasonally important, as are grains left standing or spilled during harvest. Insects in the spring and summer make up about 15 percent of a quail's total annual food consumption. Juvenile and adult quail often include insects in their diet, and insects are especially important to nesting hens and fast growing chicks. Fields with weeds and legumes attract insects that quail need.

Quail roost on the ground in grassy-weedy areas throughout the year except during severe wind or precipitation. They may roost alone or in pairs, but most commonly they roost in a disk formation when their numbers permit. Like the spokes of a wheel, each member of the disk positions itself with its tail towards the center and head outward. Roosting in this fashion is a social behavior, but during cold weather, it's also an aid to survival. Such a formation allows each member to benefit from the body heat of others.

Essential to its well-being, and one that it appears to enjoy, is the quail's habit of dusting. The quail scratches a depression or dusting bowl into the ground, pecks it free of vegetation and finely grinds the soil for a depth of 3-4 inches. When dusting, quail immerse their breasts in the bowl and throw dust across their backs with their beaks and feet. Several birds will sometimes enter the bath together and shower one another with dust. Dusting helps maintain quail feathers and reduces insect parasites.

(*continued on page 6)*

Instructional Ideas

- Learn more about the life of quail using the Student Worksheet on page 7.
- Have the students research the kinds of plants that benefit quail by season and create a habitat diorama.
- Using a flower or plant press, start a classroom collection/display of plants that benefit quail.
- Plant a habitat area on school grounds using the Quail Cover Bundle on page 15.

Habitat

Seven essential habitat components are vital to quail and their young: nesting cover, brood cover, feeding cover, roosting cover, escape cover, covey headquarters and dusting areas.

Preferred **nesting** cover includes a mix of erect grasses, forbs and scattered shrubs or brambles at a moderate density and height. Idle land, in or near the old field stage, provides the cover most frequently used for nesting.

Brood cover should be dominated by plants that have well-spaced, sturdy stems with little foliage near the ground. Overhead foliage must be dense enough to provide sufficient cover to give chicks and adults protection from predators. Bare ground is also an essential element of brood cover because a newly hatched, quarter-ounce chick is very fragile. Thick vegetation, whether erect or lying on the ground, makes it impossible for chicks to travel or forage for seeds and insects. Fescue, an aggressive cool-season grass, is an example of common pasture grass that becomes too thick for quail to feed in or move through. Native warm-season grasses, described as "bunch" grasses because they grow in clumps, provide easy access for quail to walk through them.

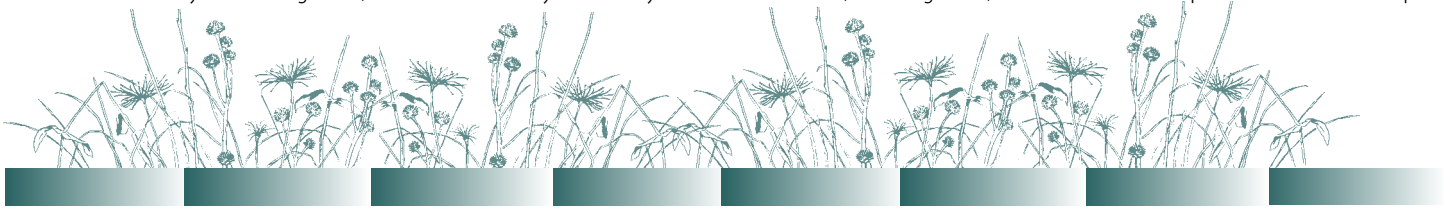
For fall and winter **feeding**, idle lands in the fallow stage are among the best because they have bare ground, cover and—usually—an array of seed-producing annual forbs for food. Old fields also provide suitable feeding areas if forbs are abundant and there is not too much litter.

Roosting is probably the only bobwhite activity where dense overhead cover is usually not required. Research shows that quail use crop fields, grasslands and old fields for roosting. Apparently the birds' camouflage and motionless state while roosting eliminate the need for cover overhead. The open sky also allows birds to flush unobstructed when approached by predators.

To a degree, any concealing vegetation can serve as **escape** cover. More often, though, escape cover implies dense cover. This includes standing crops, native grasslands and thickets of low-growing trees, vines and shrubs such as blackberry, sumac and wild plum. Dense cover is an absolute requirement within a covey's winter range for protection from the elements and predators.

Dense, woody escape cover is the anchor point of a covey home range and is called the **covey headquarters**. These areas are occupied during mid-day for loafing and dusting, and for protection and roosting during severe weather. Small wood lots with a dense understory or a finger of woodland extending into openings will sometimes serve as winter headquarters. Headquarters of different coveys are rarely, if ever, shared and tend to be well separated.

Any recent soil disturbance can be an ideal **dusting** site. Cow paths, ant hills, watering holes, roads and trails often provide these areas for quail.



Seasonal Quail Activities Key

	SPRING	SUMMER	FALL	WINTER
ACTIVITIES	Escaping Nesting Feeding Dusting Roosting	Brooding Nesting Feeding Dusting	Brooding Escaping Feeding Dusting	Roosting Escaping Feeding
FOOD	Weed seeds Greens Insects Soft ripe fruit	Weed seeds Greens Insects Soft ripe fruit	Grass seeds Legume seeds Korean lespedeza Ragweed Corn Foxtail Wheat Sumacs Sassafras Beggar-ticks Sorghum Acorns	Weed seeds Grass seeds Grain Legume seeds Nuts Tree fruits Crop residues

Seasonal Quail Activities

Student Worksheet

Directions: Throughout the year, quail engage in a number of activities related to their basic biology: nesting, brooding, feeding, roosting, escaping and dusting. For each season, research and list the following:

- **Activities** of quail and their young during the period
- **Specific** plants needed/desirable as food sources

	SPRING	SUMMER	FALL	WINTER
ACTIVITIES				
FOOD				

Directions: For each season, research and describe the habitat components vital to quail and their young in relation to the activities performed.
Note: **Not every activity is applicable to every season. Use your answers from the Activities section of the table above to guide you.**

	SPRING	SUMMER	FALL	WINTER
NESTING				
BROODING				
FEEDING				
ROOSTING				
ESCAPING				
DUSTING				

Northern Bobwhite Quail Roadside Survey

1983 - 2004 Total Birds

These tables report the mean number of individual quail per route observed by Conservation Agents along 30-mile routes during early August of each year. The number of counties (routes) surveyed each year varies from 109–112. The Zoographic Regions are illustrated below.

Z REGION	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
NWP	12.40	5.00	8.91	14.54	17.13	16.67	11.92	15.00	9.75	5.75	4.73
NR	15.85	7.82	15.42	12.53	18.53	10.82	7.42	14.64	10.91	10.09	8.55
NER	18.30	9.67	13.34	16.68	21.61	9.62	8.86	15.48	13.90	8.95	8.95
WP	23.57	8.83	21.28	40.67	38.33	34.92	21.75	23.83	30.08	19.92	17.25
WOB	17.00	7.78	2.84	11.82	15.36	10.54	10.15	8.31	11.20	6.92	5.92
OP	6.84	3.00	2.25	7.25	6.81	7.67	4.25	3.58	1.67	1.67	3.71
NEOB	7.75	2.20	7.00	6.93	5.63	2.50	1.33	3.50	3.25	3.67	5.17
ML	12.14	8.25	5.50	5.71	14.43	5.43	8.14	5.00	9.14	12.00	9.14
STATE	14.59	6.57	9.22	14.51	16.85	11.87	8.73	10.92	10.53	7.72	7.49

Z REGION	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
NWP	4.92	10.42	3.92	3.83	4.17	3.50	6.08	5.50	8.08	10.54	5.00
NR	5.36	7.55	2.36	8.09	5.18	3.00	6.09	3.45	5.36	4.18	5.54
NER	11.19	13.33	4.48	8.86	9.38	4.90	10.57	3.80	5.30	6.74	5.80
WP	21.50	15.00	15.00	13.08	8.67	11.00	9.42	6.92	1.67	3.50	3.42
WOB	12.69	8.23	5.15	6.85	6.69	4.54	2.00	5.15	3.23	3.23	2.85
OP	4.13	1.71	1.71	0.79	0.33	0.92	1.46	1.58	2.21	0.54	3.04
NEOB	1.58	1.75	2.42	2.17	2.92	1.50	1.67	0.83	0.25	1.33	0.50
ML	8.29	11.86	5.00	6.71	5.86	2.14	1.43	0.86	1.43	3.14	1.29
STATE	8.50	8.21	4.63	5.88	5.17	3.78	5.05	3.46	3.51	3.90	3.62

Instructional Ideas

- Look at the quail counts per region and draw some correlations between those numbers and the past and present vegetation cover of the region.
- Calculate the average for all years and determine the percent change from year-to-year.
- Construct a bar graph for each zoogeographic region.

ZOOGEOGRAPHIC REGIONS

Assessing Quail Populations

To keep tabs on the quail population the Department of Conservation uses a variety of census methods. These include roadside surveys, visual observations, post-season harvest surveys and whistle counts.

Quail roadside surveys are conducted by Conservation Agents in early August. Agents count the number of quail they see while driving 20 mph. along permanent 30-mile routes. These observations provide an *index* of quail abundance, and not an actual estimate of quail across the landscape. The long-term trend of the index, however, relates fairly well to other indices of quail abundance. The Agents routes are almost entirely through private land, so the quail index is a reflection of conditions on Missouri's agricultural and private recreational lands.

In addition to surveying fixed routes, conservation agents also provide their perception of quail abundance in each county. Their impressions are based on observation of quail over the entire county during May-July. They also rely on the observations and reports of quail by farmers and other landowners.

Harvest information is collected from post-season mail surveys of a random sample of Missouri small game permit holders. While harvest is mostly a measurement of hunting ability, it can provide a perspective of reproductive success for any given year or help evaluate the abundance of quail from year to year.

During June and October whistle counts can be used to keep tabs on the quail population. Counts in June provide an index of whistling males, which gives an idea of how many quail survived the winter. Although males whistle throughout the day, the most consistent measurements occur during the first two hours of daylight. On the other hand, October covey whistle counts require different tactics and provide different biological information. Fall whistling lasts only minutes each day and gives an estimate of production and pre-hunting season conditions.

Instructional Idea

- Develop a survey tool to assess wildlife species on the school grounds or nearby habitat.

Species of Concern

Dickcissel

The dickcissel *(Spiza americana)* is a small prairie songbird that has successfully adapted to farmland, weedy fields, alfalfa fields, hay fields, and other agricultural habitats. In Missouri, they are abundant in the Glaciated and Osage Plains and in the Mississippi Lowlands. In some years they are common in the larger fields in the Ozark region.

As a neotropical, migratory species, the dickcissel's population is dependent on habitats in both North and South America. Land management practices in both countries have contributed to as much as a 35 percent decline of this species between 1966 and 1994. In North America, some of the decline is attributed to destruction of nests by harvest equipment each year and a decrease in reproduction success as the habitat becomes reduced and fragmented.

In late summer, dickcissels begin their southward migration to their wintering grounds. Throughout the fall and winter, they spread out across northern South America, where much of the native grasslands have been converted to crop fields. Unfortunately, these fields provide a wonderful food source. Here flocks of dickcissels consume vast quantities of rice, resulting in reduced yields for the farmer. At night the birds return to huge roosts in sugarcane fields. Some roosts are estimated to contain three million birds, or about 30 percent of the dickcissels in the world. Every evening and morning birds arrive and depart from the roosts in flocks that are a hundred yards wide and take half an hour to pass.

These large flocks can and do cause considerable damage to agricultural fields. This competition has led to desperate and often lethal methods of control, including poisoning water holes, spraying poison on feeding areas before the birds arrive and using airplanes to dust the nocturnal roost sites with toxic pesticides. Scientists from several countries and agencies are trying to solve the problem through better management practices.

Species of Concern *(continued)*

Greater Prairie-Chicken

Greater prairie-chickens are grassland birds. Missouri once had fifteen million acres of prairie and plenty of prairie-chickens. But in the years since 1940, Missouri prairie lands have dwindled to less than 150,000 acres. The number of prairie-chickens has drifted downward from an estimate of 13,000 in 1944 to 3,000 in 1992 to 500 in 2004.

The decline of the prairie-chicken population parallels the loss of our state's tallgrass prairie. Over time, small farms growing small grain crops were replaced by large fields with low crop diversity. Extensive cultivation of native grasslands severely reduced the prairie-chicken's nesting and brood-rearing habitat. The control of prairie fires that naturally maintained grassland habitat contributed to the bird's decline. So did overgrazing and excessive hunting. Missouri, Iowa and Illinois had once been the heart of prairie-chicken populations. Now sizable populations are found only in Nebraska, Oklahoma and Kansas.

In an experimental program, the Conservation Department released a number of prairie-chickens in north-central Missouri in the springs of 1993, 1994 and 1996. The birds came from Kansas and Nebraska and were released onto lands that were historically used by prairie-chickens and determined by biologists to provide good habitat. Most of the sites were privately owned.

It is the quantity and quality of Missouri's grasslands on which the prairie-chicken's fate seems to hinge. Prairie-chickens need open land from horizon to horizon, unbroken by trees where predators, such as owls and hawks, lurk. They also need diverse grassland with vegetation of different heights and various amounts of residual material on the ground for nesting and travel lanes.

Because over 90 percent of Missouri's land is in private ownership, prairie-chicken survival primarily depends on private landowners. To help support the Department's long-range goal of restoring the birds to their original range, landowners are increasing bird habitat with management techniques, such as planting cropland with specially formulated grass seed mixtures, occasionally burning grassland, leaving patches of crops unharvested and postponing mowing until after the nesting season.

If these restoration efforts succeed, future generations of Missourians will not have to be told stories of prairie-chickens, but will be able to see these fascinating birds for themselves.

Instructional Idea

- Research and write a report that describes the prairie-chicken's mating rituals on their booming grounds.

Bachman's Sparrow

Several species of birds have been extirpated from southeast Missouri due to lack of suitable pine savanna habitat, including the red-cockaded woodpecker, brown-headed nuthatch and Bachman's sparrow. A few pairs of Bachman's sparrows still breed in Missouri on glades.

In several regions of Missouri, there is potential for pine savanna restoration, but it would take several decades to achieve suitable conditions. Several twenty-thousand-acre pine savannas will need to be restored in order to reestablish most of the suite of birds that once composed the pine savanna bird community in Missouri.

Bachman's sparrow is the most difficult to find of all Missouri's sparrows, unless you know where to look. Even then, you may look in the right habitat at ten or more locations before finding one. While there is always a chance of locating one in an old field with small, scattered oak clumps, such as where a forest had been clear-cut, you are more likely to find them in the glades of southwestern Missouri.

Bachman's sparrow

MISSOURI CONSERVATIONIST *Connections*

The *Missouri Conservationist* magazine provides a wealth of information about the forest, fish and wildlife resources of the state. Listed below are recent articles pertaining to successional habitat management and associated topics. These articles are available to view or print from the Department of Conservation's Web site at <www.missouriconservation.org>. To access the articles, follow the indicated instructions.

To access the *Missouri Conservationist* archive

Click on "Magazine" link in the top banner.
Click on "Magazine Archive" link in the top banner.
Choose the issue you'd like to view.

(**Note:** Some issues can be brought up in PDF format for printing. Check at the bottom of the issue's front page for the PDF link.)

"Bobwhite Quail Myths"
by Bill White, August 2004
Nothing is killing our quail more than a lack of suitable habitat.

"A Roadmap to More Quail"
by Elsa Gallagher, July 2004
Good habitat is the key to more quail—if you create it, they will come.

"Regenerating Oaks In Missouri's Bottomland Forests"
by Dan Dey & John Kabrick, July 2004
Bottomland oaks are strong and productive—once you get them started.

"Diamonds in the Rough"
by David Hoover, December 2003
With a little polish, your CRP grasslands will attract more wildlife.

"Why Food Plots Fail"
by David Hoover, November 2003
Could you live on food alone? Neither can wildlife.

"The Cedar Solution"
by Tom Wekenborg, May 2003
A landowner documents a connection between cedar and quail numbers.

"Creating Quality Quail Habitat"
by David Fiedler, May 2002
If you welcome them with food and cover, quail will once again whistle on your property.

"Planting Prairie"
by Greg Gremaud and Larry Rizzo, November 2001
A bold—and old—landscaping idea for your property.

"Bringing Back Quail"
by Bill White and Steve Young, March 2001
Here's a proven formula: Better habitat equals more quail.

"Missouri's Savannas and Woodlands"
by Michael Leahy, August 2000
East meets west to create stunning natural habitats.

"Only in the Ozarks"
by Charlotte Overby, February 1999
Bladderpod's recovery in Missouri's glades provides hope for other endangered species.

To access the *Outside In* archive

Click on "Education" link in the top banner.
Click on "*Missouri Conservationist* & *Outside In*" link in the green box on the left.
Click on "*Outside In*" link on the left.
Click on "Magazine Archive" in the top banner.
Choose the issue you want to view.

"Meet Mr. Bobwhite"
by Elsa Gallagher, November 2003
I'd like you to meet Mr. Bobwhite. He is a small fellow, only as tall as a soda can. Despite his size, Missourians pretty much consider him King of the Gamebirds.

"MO Quail Academy"
by Joan McKee, February 2000
Could you find a quail's nest in a large field? Do you know where a covey of quail sleeps at night? Could you look at a field and tell if quail could survive there? Have you ever hunted with a trained bird dog?

Resource Connections

Web Resources

Quail Unlimited
<www.qu.org/>
This site includes habitat information as well as a broad range of information on the various species of quail.

Noble Foundation
<www.noble.org/Ag/Index.htm>
Follow the Forage or Wildlife links for several articles about bobwhite quail and grassland management.

Missouri Prairie Foundation
<www.moprairie.org/>
The Missouri Prairie Foundation was founded to preserve some of the rapidly disappearing prairie landscape in Missouri and to secure habitat for Missouri's diminishing population of Greater Prairie-Chickens. Check out the Prairie Journal link and the links to other prairie sites.

Covey Headquarters
<www.coveyheadquarters.com/>
Follow the Newsletters link for interesting information and insight into landscape changes.

USGS Biological Resources
<biology.usgs.gov/pubs/ecosys.htm>
Appendix B has good information on habitat loss.

Build a Prairie
<www.bellmuseum.org/distancelearning/prairie/index.html>
Designed by the University of Minnesota, this site has a number of online activities and resources suitable for junior high students.

Strategic Guidance for Northern Bobwhite Recovery
<www.missouriconservation.org/landown/wild/quail/strategy>
This plan addresses quail needs on conservation areas and on private land.

Publications

Bobwhite Quail—Its Life and Management
Rosene, Walter. This book explores the topics of bobwhites, past and present; quail habits and requirements; and population accounting. ISBN: 0813506034, <www.amazon.com> ($54.63)

On Bobwhites
Guthery, Fred. This book explores the topics of life and times, management, populations, harvest, issues and philosophies. ISBN: 0890969159, <www.amazon.com> ($16.97)

A Guide to and Culture of Flowering Plants and Their Seed Important to Bobwhite Quail
Rosene, Walter and John Freeman. A handbook of plants important to quail—featuring seed identification and growth habits. ISBN: 0961827017, <www.amazon.com> ($30.00)

Managing Habitats for Conservation
Sutherland, William and David Hill. This comprehensive volume provides a pragmatic, habitat-by-habitat guide to conservation management, in which the prescriptions and methods are based on sound science coupled with practical experience. ISBN: 0521447763, <www.amazon.com> ($40.00)

A Practical Guide to Prairie Reconstruction
Kurtz, Carl. Intended to encourage economical and functional prairie plant communities in the Midwest, this guide provides a formula for success for all but the most extreme conditions. ISBN: 087745745X, <www.amazon.com> ($12.95)

The following publications are available from Acorn Publications, P.O. Box 2423, Tustin, CA 92781-2423, 800/422-8886 or <www.acornnaturalists.com>.

Ecosystems in Action: Life in a Grassland
Patent. Go on a journey that begins deep underground and grows up through sun-drenched grasses. Using the tallgrass prairie as an example, this book examines the physical features, processes, and many species of plants and animals that make up a prairie ecosystem. Ages 9-17. #B-12299 ($29.95)

Last Stand of the Tallgrass Prairie Video
Altman, Larrabee. As beautiful as it is rare, intact tallgrass prairie once covered millions of square miles stretching from the Rockies to the Eastern hardwood forests. This PBS video chronicles the history of the prairie from before human arrival through modern times. Latest research findings are also presented. Ages 9-adult, 57 minutes. #V-10045 ($14.95)

Grasses, An Identification Guide
Brown, Lauren. Popular guide to grasses and grass-like plants of the Northeast and Midwest. Over 385 beautiful, precise drawings allow for easy identification. Includes descriptions, ecology, history and uses for 135 different species of grass. #BP-6377 ($14.95)

Missouri Department of Conservation Publications
You may order any of following items by contacting our Distribution Center at 573/522-4115, ext. 3630, e-mail at pubstaff@mdc.mo.gov or writing to the Distribution Center, Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180.

Educational Resources

Prairie Habitat Pack—Grades 3-4
Includes information on the history of Missouri's prairie, parts of a grass and forb, benefits of prairies and how biologists and landowners care for our state's prairies. Resources include the following: Student magazine – 25 copies, Teacher's Guide, prairie posters and other MDC publications.

E00007	Poster: *Missouri Prairie Birds*
E00066	Poster: *Celebrate Prairies!*
E00088	Poster: *Prairie—Life Among the Grasses*
E00116	*Prairie Life of Missouri*
E00559	*Managing Land for Bobwhite Quail Instructor's Guide*—Grades 9-12 (Companion to *On the Edge* publication – see below)
PLS013	Quail Identification Card—Hen
PLS014	Quail Identification Card—Chick
PLS015	Quail Identification Card—Male

Informational Brochures

E00042	*Native Grasses for Landscaping*
E00219	*Greater Prairie-Chicken leaflet*
E00467	*Native Plants for Landscaping*
E00469	*Prairie Forbs*
PLS007	*Rich Grasslands*
PLS059	*On the Edge—A Guide to Managing Land for Bobwhite Quail* (Instructor's guide is available. See Educational Resources list above.)
SCI048	*Missouri's Natural Communities: Prairies*
W00045	*Quail at the Crossroads*

Media Loan

You may borrow the following items by contacting our Media Librarian at 573/751-4115, ext. 3821, fax at 573/522-2020, e-mail at pubstaff@mdc.mo.gov or writing to Media Librarian, Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180.

Bringing Back Bobwhite Quail
Adult/ 2004/ 26-minute video
Join us on a tour of Missouri farms and see how landowners are bringing back bobwhite quail. This tour shows how a little effort and investment can help preserve a legacy for present and future generations.

Managing CRP Lands for Wildlife
High School-Adult/ 2000/ 15-minute video
This video shows you how to implement approved management practices such as prescribed burning, strip diking, shrub planting and food plots to improve CRP lands for small game wildlife and grassland songbirds.

Missouri's Tallgrass Prairie: An American Original
Junior High-Adult/ 2001/ 49-minute video
Journey into Missouri's tallgrass prairies, a colorful world teeming with life. Explore the story of these rare and special lands with original music and narrative verse read by James Earl Jones.

Quail Country
Adult/ 1989/ 20-minute video
Three landowners describe their interest in quail and what they've done on their farms to improve habitat for these appealing upland game birds.

Project Connections

Put your students in the role of decision makers as they learn about critical habitat and land management with these interdisciplinary, hands-on, easy-to-use activities from Project Learning Tree and Project WILD. To receive these nationally acclaimed conservation education curriculum and activity guides, attend a training workshop in your area. For more information contact Syd Hime, Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102, 573/522-4115, ext. 3370, <syd.hime@mdc.mo.gov>

Project Learning Tree

Story of Succession—Forest Ecology Secondary Module – Page 71—Identify successional stages in various ecosystems on the basis of vegetation types; draw conclusions about the process of succession on the basis of observing three test plots; recognize basic relationships between species diversity and ecosystem stability. Grades 9-12.

Understanding Fire—Forest Ecology Secondary Module – Page 82—Investigate the ecological significance of fire; study the frequency and scope of fires and their influence on patterns of forest succession; examine the controversial issues influencing decisions about controlling wildfires. Grades 9-12.

Fire Management—Forest Ecology Secondary Module – Page 96—Research plant and animal species that depend on forest fire and determine interrelationships; examine controversial issues influencing decisions about controlling wildfires near the wildland-urban interface. Grades 9-12.

Project WILD

Carrying Capacity – Page 46—Formulate and test hypotheses related to wildlife populations and carrying capacity; describe the significance of carrying capacity. Grades 9-12.

Time Lapse – Page 164—Describe successional changes in an ecosystem and the factors that affect these changes; relate species diversity to successional habitat changes. Grades 5-8.

Shrinking Habitat – Page 314—Describe some effects of human development of land areas on plants and animals living or previously living in the area; evaluate the importance of suitable habitat for wildlife; recognize that loss of habitat is generally considered to be the most critical problem facing wildlife today. Grades 5-8.

Smokey Bear Said What? – Page 318—Identify positive and negative consequences of forest and grassland fires; describe some of the changes fire can make in ecosystems. Grades 5-8.

From Bison to Bread: The American Prairie – Page 395—Describe the habitat needs of prairie plants and animals; discriminate between plant and wildlife species that have benefited from changed prairie use and those that have not; articulate reasons to develop or preserve prairies; describe how preservation and development might be balanced. Grades 9-12.

Improving Wildlife Habitat in the Community – Page 447—Apply their knowledge of wildlife by describing essential components of habitat in an arrangement appropriate for the wildlife; evaluate compatible and incompatible uses of an area by people and specified kinds of wildlife. Grades 5-8.

Quail Instructor's Guide

New! *Managing Land for Bobwhite Quail Instructor's Guide*. Developed for teachers to assist them in leading their students through *On the Edge: A Guide to Managing Land for Bobwhite Quail*. Topics covered include the history of bobwhite quail in Missouri, population dynamics, characteristics and habitat needs, as well as managing and creating quail habitat. The guide also includes lesson plans, evaluations and activities. To receive a copy, see the ordering information in the Resource Connections section on page12.

Missouri Quail Academy

Here's your chance to participate in hands-on training in quail management and natural resource conservation designed for Missouri high school students. This week-long summer training is free to qualified students. In addition, five teachers are selected as Covey Leaders for each academy. For more information or to obtain an application, contact your high school counselor, biology teacher, agriculture instructor, Soil and Water Conservation District Office or a Missouri Department of Conservation Regional office. Or call Quail Unlimited at 660/885-7057.

New this Spring!

A Quail Habitat Pack, targeted for 7-12 grade, is scheduled for release in March. The pack will contain a newly-developed poster, brimming with information about habitat management for quail and ideas for classroom activities; the winter issue of *The Conservation Resource*, focused on critical habitat; the MDC publication *On the Edge: A Guide to Managing Land for Bobwhite Quail*, with its associated Teacher's Guide; and numerous other related MDC publications.

Missouri Herbs and Wildflowers

Jerry J. Presley Education Center, near Eminence
05/06/2005 - 05/07/2005
Identification and uses of many native plants will be just part of this two-day workshop. A field trip to Tingler Prairie and VanDerhoef Forest will be included. Show-Me Standards will be addressed for all grade levels and content fields. Project Learning Tree will be provided as part of this training. Limit 23. For enrollment or more information, contact: Melanie Carden-Jessen at 417/255-9561, ext. 236. To register, call Karen Copeland at 1-888-TRY-SMSU.

Outdoor Skills Workshops

For information about Outdoor Skills courses offered by the Missouri Department of Conservation, visit our Web site at <www.missouriconservation.org/events/> or contact your local regional office.

Educator Workshops

For information about our Teacher Education courses, visit our Web site at <www.missouriconservation.org/teacher/workshops/workshops.html> or contact your local regional office.

Conservation Education Materials

Listing over 80 titles, the Conservation Education Materials request Form includes instructional resources, student activity books, posters and programs available to Missouri educators. Materials can be ordered through the Department's Web site at <www.missouriconservation.org/teacher/> or by contacting your local regional office.

Quail Cover Bundle

An important part of quail habitat is shrubby, brushy cover. The plants in this bundle were selected to provide this habitat component. Each bundle includes 10 each: aromatic sumac, blackberry, false indigo, roughleaf dogwood and wild plum. For more information or to order trees online visit our Web site at <www.missouriconservation.org/forest/nursery>

Regional Offices

Central Office, Jefferson City	573/751-4115
Central Regional Office	573/882-8388
Kansas City Regional Office	816/655-6254
Northeast Regional Office	660/785-2424
Northwest Regional Office	816/271-3111
Ozark Regional Office	417/255-9561
Southeast Regional Office	573/290-5730
Southwest Regional Office	417/895-6881
St. Louis Regional Office	636/300-1953

Conservation Careers

Private Land Conservationist

Because 93 percent of Missouri's land is in private ownership, a private land conservationist has a large audience to work with. These professionals work directly with landowners to implement habitat management practices that benefit species of concern and their associated habitats. Communication is a key component of this job. Working with federal agencies such as the U.S. Fish and Wildlife Service, and conservation groups such as The Nature Conservancy and the Missouri Prairie Foundation, the private land conservationists identify opportunities, both financial and technical, to assist landowners in restoring critical habitat on their land.

In the southwest counties of the state, the focus is on restoring glade and savanna habitats. Here management practices may include thinning woodlands and prescribed burning. These practices improve the habitat for game animals such as deer and turkey while also benefiting species of concern such as the Bachman's sparrow, painted bunting and eastern collared lizard. In the northwest part of the state, restoration focuses on native prairies in the loess hills. Prescribed burning and cedar control help these landowners improve the habitat on their land for quail and other upland bird species. Along the Missouri River, in the east central part of the state, private land conservationists work with landowners to implement timber stand improvement practices that benefit ruffed grouse.

To be successful with the restoration of these habitats, the private land conservationist works closely with the landowner to develop and implement a management plan that best suits the land, as well as the owner's needs. This often presents challenges, such as finding a balance between agriculture production and wildlife habitats, as well as securing financial resources. Overcoming these challenges requires innovation, dedication and a sincere desire to help people. The rewards come when satisfied landowners call to share their excitement of seeing an increase in habitat diversity and wildlife on their land.

Private land conservationists with the Missouri Department of Conservation have graduated from an accredited college or university with a bachelor's degree in wildlife, forestry or agriculture and have had at least three years' experience in the field.

Removal/Change of Address Form

If you would like to be removed from *The Conservation Resource* mailing list or would like to have the publication mailed to a different address, please fill out the form, clip and mail to the address below. This form can also be found and submitted online at <www.missouriconservation.org/teacher/>.

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Missouri Department of Conservation
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The Conservation Resource is published three times a year—fall, winter and spring—by the Missouri Department of Conservation Outreach and Education Division. Its purpose is to provide current information on conservation topics and resources for integrating those topics into instructional lessons.

Write to us for a free subscription:
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